PE TITLE: C3 Subsystem Integration

## RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

February 1999

**BUDGET ACTIVITY** 

PE NUMBER AND TITLE

## 3 - Advanced Technology Development

0603726F C3 Subsystem Integration

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|---|-------------------|---------------------|---------------------|---------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|------------|
| COST (\$ In Thousands)  | FY 1998<br>Actual | FY 1999<br>Estimate | FY 2000<br>Estimate | FY 2001<br>Estimate             | FY 2002<br>Estimate | FY 2003<br>Estimate | FY 2004<br>Estimate | FY 2005<br>Estimate | Cost to<br>Complete | Total Cost |
| Total Program Element (PE) Cost   | 7,591             | 10,993              | 9,122               | 4,920                           | 5,852               | 6,752               | 6,893               | 7,036               | Continuing          | Continuing |
| 2810 Advanced Image/Information/Optical Memory<br>Technology Applications | 3,890             | 5,832               | 3,562               | 4,920                           | 5,852               | 6,752               | 6,893               | 7,036               | Continuing          | Continuing |
| 2863 Integrated Photonics   | 3,701             | 5,161               | 5,560               | 0                               | 0                   | 0                   | 0                   | 0                   | 0                   | TBD        |
| Quantity of RDT&E Articles  | 0                 | 0                   | 0                   | 0                               | 0                   | 0                   | 0                   | 0                   | 0                   | 0          |

Note: Beginning in FY 1998, Project 2810, Advanced Image/Information Applications, and Project 3192, Advanced Optical Memory Technology, were combined into Project 2810, Advanced Image/Information/Optical Memory Technology Applications. In FY 2001, the efforts in Project 2863, Integrated Photonics, will be conducted in Project 69CK, PE 0603203F.

- (U) A. <u>Mission Description</u>: This Advanced Technology Development program develops and demonstrates Command, Control, and Communications (C3) technologies in the areas of processing and fusion of digital databases, photonics technology, optical disk storage/processing of digital information, and distributed processing technology for interoperability between dispersed command centers. These technologies provide increased storage, processing, and transmission of digital data received from a broad variety of sensors and sources.
- (U) **B.** <u>Budget Activity Justification</u>: This program is in Budget Activity 3, Advanced Technology Development, since it develops and demonstrates technologies for existing system upgrades and/or new system developments that have a military utility and address warfighter needs.

Page 1 of 8 Pages

Exhibit R-2 (PE 0603726F)

| RDT&E BUDGET ITEM JUS                                    | DATE <b>February 1999</b> |                              |                   |                         |                          |
|--|---------------------------|------------------------------|-------------------|-------------------------|--------------------------|
| BUDGET ACTIVITY  3 - Advanced Technology Development     |                           | PE NUMBER AN <b>0603726F</b> |                   | tem Integratio          | on                       |
| U) C. Program Change Summary (\$ in Thousands):          |                           |                              |                   |                         |                          |
|  | EV 1009                   | EV 1000                      | EV 2000           | EV 2001                 | Total                    |
| U) Previous President's Budget/FY 1999 PB                | <u>FY 1998</u><br>9,364   | <u>FY 1999</u><br>11,025     | FY 2000<br>11,295 | <u>FY 2001</u><br>6,606 | <u>Cost</u><br>Cont      |
| U) Appropriated Value                                    | 9,304<br>9,922            | 11,025                       | 11,293            | 0,000                   | Cont                     |
| U) Adjustments to Appropriated Value                     | 9,922                     | 11,023                       |                   |                         |                          |
| a. Congressional/General Reductions                      | -324                      | -32                          |                   |                         |                          |
| b. SBIR  | -239                      | 32                           |                   |                         |                          |
| c. Omnibus/Other Above Threshold Reprogrammings          | -63                       |                              |                   |                         |                          |
| d. Below Threshold Reprogrammings                        | -1,705                    |                              |                   |                         |                          |
| e. Rescissions   | -,,                       |                              |                   |                         |                          |
| U) Other Adjustments to Budget Years Since FY 1999 PB    |                           |                              | -2,173            | -1,686                  |                          |
| U) Current Budget Submit/FY 2000 PB                      | 7,591                     | 10,993                       | 9,122             | 4,920                   | Cont                     |
| Program. FY 1999: \$322 identified as a source for SBIR. |                           |                              |                   |                         |                          |
|  |                           |                              |                   |                         |                          |
|  |                           |                              |                   |                         |                          |
|  |                           |                              |                   |                         |                          |
|  |                           |                              |                   |                         |                          |
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|  |                           |                              |                   |                         |                          |
|  |                           |                              |                   |                         |                          |
|  |                           |                              |                   |                         |                          |
|  | Pa                        | age 2 of 8 Pages             |                   | E                       | khibit R-2 (PE 0603726F) |

| RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)  |                   |                     |                   |         |                     | DATE <b>Fe</b>      | bruary 19           | 999                    |                     |            |
|---|-------------------|---------------------|-------------------|---------|---------------------|---------------------|---------------------|------------------------|---------------------|------------|
| BUDGET ACTIVITY 3 - Advanced Technology Development  PE NUMBER AND TITLE  0603726F C3 Subsystem Integration |                   |                     |                   |         | egration            |                     |                     | PROJECT<br><b>2810</b> |                     |            |
| COST (\$ In Thousands)  | FY 1998<br>Actual | FY 1999<br>Estimate | FY 200<br>Estimat |         | FY 2002<br>Estimate | FY 2003<br>Estimate | FY 2004<br>Estimate | FY 2005<br>Estimate    | Cost to<br>Complete | Total Cost |
| 2810 Advanced Image/Information/Optical Memory Technology Applications                                      | 3,890             | 5,832               | 3,                | 562 4,9 | 20 5,852            | 6,752               | 6,893               | 7,036                  | Continuing          | Continuing |

(U) A. Mission Description: This project develops and demonstrates techniques and algorithms to meet weapon systems requirements for processed and fused multisource information needed for mission planning, navigation, targeting, and terrain analysis. It provides generic language translation processing techniques, state-of-the-art algorithms for Air Force exploitation of digitally processed image and spatial (i.e., latitude, longitude, and elevation) database products, automated capabilities to reference and display hypermedia (multi-media) information, and defensive information warfare technologies. This project also develops erasable optical data storage systems with high capacity and fast input/output speed for fighter aircraft (to provide fast airborne access to mission-oriented data and the digital terrain system) and electronic surveillance aircraft (for on-board sensor data recording, operational mission planning requirements, and large data storage requirements (i.e., high-volume, soft-copy, digital imagery exploitation)). Algorithms will be developed to automate the selection, retrieval, and downloading of information stored on mass storage devices that are distributed across the data network. An array of optical disk drives will be developed for high-throughput speed and fault-tolerant requirements. Three-dimensional (3-D) optical memory systems will be developed for volumetric digital data storage. This new mass storage technology will demonstrate ultra-high data density and fast, parallel data access within a low-cost, compact system.

#### (U) <u>FY 1998 (\$ in Thousands)</u>:

| - (U) | \$3,000 | Developed and demonstrated advanced imagery information, spatial data base, and information correlation technologies to enhance              |
|-------|---------|--|
|       |         | warfighter mission planning, navigation, targeting, and terrain analysis.  |
| -(U)  | \$155   | Developed and demonstrated automated capabilities to collect, integrate, extract, and disseminate hypermedia (integrated text, imagery,      |
|       |         | audio, and video) information which fully exploit relationships between data available to the field commander in a timely manner.            |
| -(U)  | \$430   | Developed and demonstrated optical, 3-D information data handling, storage, and access technologies for strategic and tactical applications. |
| -(U)  | \$305   | Designed, developed, and demonstrated optical disk and interface technologies that can be implemented in joint theater operations.           |
| -(U)  | \$3,890 | Total  |

Project 2810 Page 3 of 8 Pages Exhibit R-2A (PE 0603726F)

| RDT   | February 1999  |  |                                  |
|---|--|--|----------------------------------|
| DGET ACTIVITY - Advanced Techr              | ology Development  | PE NUMBER AND TITLE 0603726F C3 Subsystem Integration                      | PROJEC<br><b>2810</b>            |
| (I) FW 1000 (A : FW                         |  |  |                                  |
| (U) <u>FY 1999 (\$ in Th</u><br>– (U) \$574 |  | agery information, sensor fusion, and spatial database technologies t      | o enhance warfighter mission     |
| (-)   | planning, navigation, targeting, and ter                                     |  | Č                                |
| - (U) \$1,657                               |  | mated capabilities to harvest, process, disseminate, and display intell    | ligence and sensor data to       |
| (II) \$2.206                                | improve the sensor exploitation process                                      | s.<br>hree-dimensional (3-D) optical information data handling, storage, a | nd agges tachnologies includi    |
| - (U) \$2,396                               | erasable and read-only memories.   | ince-differential (3-D) optical information data fianding, storage, a      | nd access technologies including |
| - (U) \$361                                 |  | nstrate optical disk and interface technologies that can be implemen       | ted in joint theater operations, |
| (-)   |  | Many Times (WORM) 3-D memory and Jukebox Redundant Array o                 |                                  |
| – (U) \$673                                 |  | sion planning and rehearsal capabilities for theater battle management     | nt including semi-automated,     |
| (T.T.)                                      |  | ent for Command and Control requirements.                                  |                                  |
| - (U) \$171<br>- (U) \$5,832                | Identified as a source for SBIR.  Total                                      |  |                                  |
| - (0)\$5,632                                | Total  |  |                                  |
| (U) FY 2000 (\$ in Th                       | ousands):  |  |                                  |
| - (U) \$600                                 |  | agery and signal intelligence information, sensor fusion engine, and       | spatial database technologies to |
| (II) #1.2.c2                                |  | navigation, targeting, and terrain analysis.                               |                                  |
| - (U) \$1,262                               | Develop and demonstrate automated care the sensor exploitation process.      | pabilities to locate, retrieve, process, distribute, and display intellige | nce and sensor data to improve   |
| - (U) \$600                                 | * *  | 'Associative Recall module optical information data handling, storag       | e, and access technologies to    |
| (6) 4000                                    | enable advanced fusion processing tech                                       |  | e, and access teemiorogies to    |
| - (U) \$300                                 |  | ptical disk and interface technologies that can be implemented in joi      | nt theater operations, including |
| (T) 4000                                    | WORM devices.  |  |                                  |
| – (U) \$800                                 | Design, develop, and demonstrate missisoftware for joint Command and Control | ion planning and rehearsal capabilities for theater battle managemer       | it, including the demonstration  |
| - (U) \$3,562                               | Total  | of (C2) requirements.  |                                  |
| (3) 43,502                                  |  |  |                                  |
|   |  |  |                                  |
|   |  |  |                                  |
|   |  |  |                                  |
|   |  |  |                                  |

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Exhibit R-2A (PE 0603726F)

Project 2810

| RDT  | RE BUDGET ITEM JUSTIFIC   | CATION SHEET (R-2A Ext  | nibit) DATE Febr                           | uary 1999           |
|--|---|---|--|---------------------|
| BUDGET ACTIVITY  |   | PE NUMBER AND TITLE   | •  | PROJECT             |
| 3 - Advanced Techi   | nology Development  | 0603726F C3 Subsy   | ystem Integration                          | 2810                |
| (U) FY 2001 (\$ in Th  | oneaude).   |   |  |                     |
| - (U) \$1,100  | <del></del>   | gery and signal intelligence information, a ttle Management Core Systems.             | adaptive sensor fusion engine, and spatia  | l database          |
| - (U) \$2,076  | Develop and demonstrate automated cap improve the sensor exploitation process f   | · · · · · · · · · · · · · · · · · · ·   | isplay multi-source intelligence and sense | or databases to     |
| - (U) \$544  | Continue to develop Smart Memory and  | related optical information data handling dimensional, Petabyte memory brassboar      |  | ategic and tactical |
| – (U) \$200  | Design and develop optical disk and inte  |   | al, self-organizing storage and manageme   |                     |
| - (U) \$1,000  | Design, develop, and demonstrate Comm   | nand and Control (C2) mission planning a<br>ly functional software for assessment aga |  |                     |
| - (U) \$4,920  | Total   |   |  |                     |
| <ul><li>(U) B. Project Change S within the S&amp;T Program.</li><li>(U) C. Other Program I</li></ul> | ummary - Description of Significant Cha  Sunding Summary:   | nges: Changes to this program since the   | previous President's Budget are due to     | higher priorities   |
| <ul><li>(U) PE 0603789F</li><li>(U) PE 0603728F</li></ul>  | F. Command, Control, and Communication<br>F. C3 Advanced Development.<br>F. Advanced Computing Technology.<br>That is been coordinated through the Reliance |   | te duplication.                            |                     |
| (U) D. Acquisition Strate  | gy: Not Applicable.   |   |  |                     |
| (U) E. Schedule Profile:   | Not Applicable.   |   |  |                     |
| Project 2810   |   | Page 5 of 8 Pages   | Exhibit R-2A (PE 06                        | 03726F)             |

| Pevelopment  FY 1998 Actual  3,701  electronic systems are so also limit traditional electronical and strategic Commendation and systems. This project are dead and demonstrated analysis, as well as sensored and demonstrated microdical and tested high performance and tested high per | tronic system nand, Contro t develops ar  log and digit or integration rowave/milli ystems at inc mance optica                                      | FY 2000 Estimate  5,560 electromagns. Photonicol, and Commond demonstrated al optical commond and automa meter-wave creased frequal control sys         | es-based syst<br>munications<br>ates advance<br>imponents ar<br>atic target ide<br>photonics con<br>iencies, band  | FY 2002 Estimate  0 rence, electro ems process (C3) system d hardware  and processing entification to components, j lwidth, and   | FY 2003 Estimate  0 comagnetic processing automation of the companies of t | FY 2004 Estimate  0 ulse, and rad a in the form g small-size n optical pro-  | FY 2005 Estimate  0 io frequency of light (pho, high-perfor possing, ada e real-time defillance systems  | Cost to Complete  0 (RF) interfectoric) signarmance, high aptive transmentata for pre-arms.  | Total Cost  TBI  Perence.  Als and  A-capacity,  Aission,  Tand post-   |
|--|---|---|--|---|--|--|--|--|---|
| Actual  3,701  electronic systems are stalso limit traditional electronical and strategic Comments and systems. This project and demonstrated analysis, as well as sensor and demonstrated microdical and tested high performed and tested high performed.   | Estimate  5,161  usceptible to tronic system and, Control to develops and digit or integration rowave/millingstems at incomance optical             | 5,560 electromagns. Photonically, and Command demonstrated all optical command automater-wave creased frequal control sys                               | estimate  0 netic interferes-based systemunications ates advance emponents are atic target ide photonics collencies, band  | rence, electrorems process (C3) system d hardware and processing entification to components, plwidth, and   | Estimate  0  comagnetic prosint information as by enabling technology in the processing and the processing a | Estimate  0 ulse, and rad n in the form g small-size n optical pro-  | Estimate  0  io frequency of light (pho , high-perfor occssing, ada e real-time d cillance syste   | (RF) interference of the property of the prope | TBI erence.  als and a-capacity, aission,  and post-  |
| electronic systems are stalso limit traditional electronical and strategic Comments and systems. This project and demonstrated analysis, as well as sensor and demonstrated microdical radio frequency (RF) systems and tested high performs   | usceptible to<br>tronic system<br>nand, Contro<br>t develops an<br>log and digit<br>or integration<br>rowave/milli<br>ystems at inc<br>mance optica | al optical co<br>and automa<br>meter-wave<br>creased frequal<br>control sys   | netic interferes-based systemunications ates advance emponents are tic target ide photonics collencies, bance  | rence, electro<br>ems process<br>(C3) system<br>d hardware<br>ad processin<br>entification to<br>omponents, j<br>lwidth, and  | omagnetic programme information as by enablin technology in the processing and the proces | ulse, and rad<br>n in the form<br>g small-size<br>n optical pro-<br>es to provide<br>pectral surve<br>nd subsystem   | tio frequency<br>of light (pho<br>, high-perfor<br>occessing, ada<br>e real-time d<br>cillance syste   | (RF) interfection (RF) interfe | erence. uls and n-capacity, nission, and post-  |
| also limit traditional electrical and strategic Commed systems. This projected and demonstrated analysis, as well as sensor and demonstrated micing dradio frequency (RF) systems and tested high performs.  | tronic system nand, Contro t develops ar  log and digit or integration rowave/milli ystems at inc mance optica                                      | al optical co<br>and automa<br>meter-wave<br>creased frequal<br>control sys   | es-based syst<br>munications<br>ates advance<br>imponents ar<br>atic target ide<br>photonics con<br>iencies, band  | ems process<br>(C3) system<br>d hardware<br>ad processing<br>entification to<br>omponents, j<br>lwidth, and   | s information s by enablin technology i g technologi using multisp processing as   | in the form<br>g small-size<br>n optical pro-<br>es to provide<br>pectral surve<br>nd subsystem  | of light (pho, high-perforencessing, adare real-time defillance system)  | otonic) signarmance, high aptive transmata for pre- a  | als and<br>a-capacity,<br>aission,<br>and post-   |
| demonstrate, and test an<br>mission analysis, as well<br>and demonstrate microw  | nalog and dig<br>l as sensor ir<br>ave/millimet   | gital hardene<br>ntegration an  | gle coverage, d optical cor ad automatic   | broadband<br>mponent pro<br>target ident  | frequency (iperformance  | SHF) and exe, and anti-ja<br>nologies to p   | m capability<br>provide real-<br>tral surveilla  | time data for  | r pre-  |
| nce, and anti-jam capabil  |   |   |  |   |  |  |  |  | roadband  |
|  | mission analysis, as wel<br>and demonstrate microwarable RF systems at incr<br>high performance optica  | and demonstrate microwave/millimetrable RF systems at increased freque high performance optical control systems, and anti-jam capability for satelline. | emission analysis, as well as sensor integration are and demonstrate microwave/millimeter-wave photoable RF systems at increased frequencies. high performance optical control systems for RF unce, and anti-jam capability for satellite communication. | mission analysis, as well as sensor integration and automatic and demonstrate microwave/millimeter-wave photonics comparable RF systems at increased frequencies. high performance optical control systems for RF (SHF) phase ance, and anti-jam capability for satellite communications. Sta | emission analysis, as well as sensor integration and automatic target ident<br>and demonstrate microwave/millimeter-wave photonics components, produrable RF systems at increased frequencies.<br>high performance optical control systems for RF (SHF) phased array antegrate, and anti-jam capability for satellite communications. Start developm   | emission analysis, as well as sensor integration and automatic target identification using and demonstrate microwave/millimeter-wave photonics components, processing, and tarable RF systems at increased frequencies. high performance optical control systems for RF (SHF) phased array antennas providince, and anti-jam capability for satellite communications. Start development of a Tru | emission analysis, as well as sensor integration and automatic target identification using multispect and demonstrate microwave/millimeter-wave photonics components, processing, and subsystems tarable RF systems at increased frequencies. high performance optical control systems for RF (SHF) phased array antennas providing extremel ance, and anti-jam capability for satellite communications. Start development of a True Time Dela | mission analysis, as well as sensor integration and automatic target identification using multispectral surveillar and demonstrate microwave/millimeter-wave photonics components, processing, and subsystems for advanced trable RF systems at increased frequencies.  high performance optical control systems for RF (SHF) phased array antennas providing extremely wide angle tance, and anti-jam capability for satellite communications. Start development of a True Time Delay processor.  | high performance optical control systems for RF (SHF) phased array antennas providing extremely wide angle coverage, bance, and anti-jam capability for satellite communications. Start development of a True Time Delay processor. |

| RDT  | nibit) Peb   | ruary 1999   |   |  |
|--|--|--|---|--|
| BUDGET ACTIVITY  3 - Advanced Tech   | nology Development   | PE NUMBER AND TITLE  0603726F C3 Subsy   | stem Integration  | PROJECT <b>2863</b>  |
| (U) FY 2000 (\$ in T - (U) \$282  - (U) \$1,968  - (U) \$700  - (U) \$2,610  - (U) \$5,560  (U) FY 2001: Not A | housands):  Develop, integrate, demonstrate, and te time data for pre- and post-mission ana surveillance systems for air and space p Develop and demonstrate microwave/m frequency (RF) systems at increased fre Develop high performance control syste and anti-jam capability for Global Posit (In FY 2001, this effort will be conduct Complete development and demonstrat including erasable and read-only memor Total  pplicable.  mary - Description of Significant Change | st analog and digital optical micro-network lysis, as well as sensor integration and autolatforms.  illimeter-wave photonics processing and suquencies.  ems for RF phased array antennas providing ioning System (GPS) applications. Contined in Project 69CK, PE 0603203F.) ion of three-dimensional optical informationies. | c processing technologies and compone omatic target identification using multi ubsystems for advanced, optically-conting extremely wide angle coverage, broad nue to develop a photonics True Time I on data handling, storage, and access te | ents to provide real-<br>spectral<br>rolled, radio<br>dband performance,<br>Delay processor. |
|  |  |  |   |  |

# DATE RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit) February 1999 **BUDGET ACTIVITY** PE NUMBER AND TITLE PROJECT 3 - Advanced Technology Development 0603726F C3 Subsystem Integration 2863 (U) C. Other Program Funding Summary: (U) Related Activities: (U) PE 0602702F, Command, Control, and Communications (C3). (U) PE 0603789F, C3 Advanced Development. (U) PE 0603728F, Advanced Computing Technology. (U) PE 0603203F, Advanced Aerospace Sensors. (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. (U) D. Acquisition Strategy: Not Applicable. (U) E. Schedule Profile: Not Applicable. Exhibit R-2A (PE 0603726F) Project 2863 Page 8 of 8 Pages